REMARKS

The drafting of new claims addresses indefiniteness perceived by the Examiner in the original claims, which have now been withdrawn from consideration.

New independent Claims 23 and 27 reflect a dual mode operation with independent route negotiation, and coordinated emergency braking; this provides operational security without undue complexity in installation and maintenance, and so is robust operationally.

GENERAL COMMENTS

The present invention imports 'railway discipline' route negotiation approach to road vehicles.

Primary route negotiation, by embedded route delineation,
is entirely independent of tabulation used for secondary emergency back-up.

The ethos is to steer and bring vehicle to a halt safely - not to retrieve a path or continue a journey, so there is no attempt or need to try regaining route with primary system.

This allows a simplified, but fit-for-purpose, route negotiation system;
thus overall, the present invention makes a useful contribution to the (mini-tram) vehicle art .

Anecdotally, the project has been supported by the prestigious UK National Science foundation and has undergone successful trials in the Spencer (late Lady Diana) family estate and in Stratford Upon Avon town (Shakespeare birthplace) .

BACKGROUND PERSPECTIVE

In comprehending the objectives and context of the present invention, we offer the following background perspective:

Route Navigation vs. (Wide) Area Navigation

Generally, open (wide) area navigation is inappropriate for a confined or highly prescribed route. The present invention adopts confined local route negotiation - without need for computationally demanding (in software, firmware and hardware) area navigation.

The present invention thus provides a robust, matched-for-purpose, dual mode (normal + emergency backup) route negotiation solution. Strictly, there is (albeit not made explicit in the disclosure) a distinction between navigation (with implicit freedom of choice) and negotiation

(following a prescribed route). A loose parallel might be drawn with a railway, where the track is tightly, indeed physically, constrained. This simplifies equipment demands and allows more robust action and backup; such negotiation capability can be implemented in firmware.

In contrast, open (wide) area navigation, such as satellite or inertial derived coordinate fix, is more elaborate, vulnerable, uncertain and expensive than justified for confined local routing - let alone constrained to a delineated path. Nor is it robust upon system failure or location loss.

(On-Track) Ground Reference

It is generally more cost-effective directly to interface with a ground reference - such as local route beacons or embedded (buried) on track reference nodes. A dedicated route line tracker can then follow route line marking or delineation. A vehicle is not 'free to roam' over an area, but with its permitted track kept within prescribed (departure error) bounds about a delineated route. The error margin is more readily met with track markers than area navigation fix. There is thus no need to provide for navigation wherever a vehicle may be, but rather promptly to recognize prescribed route departure and initiate simplified shut-down - without attempt to regain a route once lost. A potential downside is reserve provision - once a track line has been lost or departure excessive - to revert or regain track.

Fail - Safe Line Tracking

The present case is concerned with prescribed route negotiation by line tracking - with independent backup provision for automated fail safe (local) directional control under emergency braking, upon 'loss' of route line expressed as an error 'bound'.

Error Trap

Such error trapping and abort – that is identifying promptly and containing (i.e., stopping error escalation) - is achieved without arbitration or interpolation between competitive, alternative, independently-derived, navigation solutions, as in the cited art.

Intervention

Intervention by coordinated interlinked wheel braking (to stop) and backup orientation is prompted by continual referral to a route line tracker, but implemented using a route steering action reference library. A vehicle can be stopped at a safe location by reference to a backup store of successive incremental steering actions - per a look-up table.

Emergency (secondary) steering mode is not dependent upon (primary) navigation or steering. Rather, an emergency is expressed by 'perceived' failure (or inconsistent finding) of a (primary) guidance pathway route tracker - whereupon an unrelated secondary facility is brought into play. The primary system is simply superceded or over-ridden.

Sequential Steering Action Library

Secondary steering uses a reference library of sequential steering actions with no reliance upon area navigation, or indeed external factors. A particular role is a light bus, tram or carriage - using 'soft' rails through buried route pathway guidance markers.

Commercial Considerations

A commercial exposition of safe, economical and simply designed steering system for public transport vehicles implementing the present invention can be viewed on the web site of Minitram (TM) Systems (www.tdi.uk.com/minitram).

In an example of the subject case, a primary system detects signals generated in the wires buried below a roadway surface and uses them to steer the vehicle.

The received signal is processed to determine vehicle deviation from a guideway central line - enabling smaller clearances than manual steering would require.

The secondary system requires no software program to hold delineated route definition and automatically takes over from the primary system to steer a vehicle within a designated guideway and bring it to a safe (steered) stop.

Upon recognizing a primary system failure, an emergency combined steering and braking system triggers braking and brings the vehicle to a halt while preserving directional control through independent steering action.

ARGUMENT WITH RESPECT TO PRIOR ART

In relation to the original claims, Margolis was made primary reference on its own account and in purported combination with disparate other art identified - mostly Coffino, Bush, Tachibana, Mio, Fujii, Tamura, Lemelson, in headline summary as follows:

US 5390118 Margolis
Lateral guidance control system, controlling vehicle direction along a predetermined path.

US 6288629 Cofino
RFID tags used for identification and location of objects, with information sent to a base station.

US 5708427 Bush
Electronic detection of vehicles position relative to successive markers installed in series along road lane, in-lane detection.

US 5815825 Tachibana
Vehicle guidance system, using magnetic markers laid on a road, at reduced intervals on curves.

US 6081756 Mio
Vehicle running management system, incorporating markers recording data on vehicles and available for interrogation. Vehicles driven according to communicated information of running states of nearby vehicles.

US 5315295 Fujii
Vehicle navigation system which controls vehicle speed when making a turn, utilizes selective grouping of route markers.

US 6269897 Tamura
Steering control device controlled by signals from magnetized nails buried in road at intervals.

US 6275773 Lemelson
GPS collision avoidance warning and control system, with ability to trigger emergency braking.

We contend that Margolis is no longer a disclosure undermining novelty or inventive step of the subject invention, as expressed in the substitute claims, for the reasons set out below:

Margolis represents an overly elaborate approach - with attendant complexity and cost - to that of the subject invention, as reflected in the revised claims; Margolis recognizes the limitations of inductive sensors for embedded wires to relatively slow moving robotic vehicles. Rather Margolis is concerned with a look-ahead capability for higher speeds and with enhanced capability of tracking and reaction; in contrast, the present case is concerned with 'tramway' public service vehicles on localized routes – i.e., not open expressways.

Thus, safety, rather than outright speed or sophistication for speed suit the agenda of the present invention; safety means an independent back-up mode to meet public service vehicle construction and use regulations and health and safety statutes; Margolis has no such facility, but rather relies upon constant internal correction of a primary system; nor does Margolis provide any independent route negotiation; nor is there any facility for interface with or coupling to any secondary system, nor arbitrating between them; so no combination with other art is feasible.

Cofino represents a wholly different - and essentially incompatible - approach from Margolis, by reliance upon 'floating' radio frequency transponder tags for individual location and identification - by issuing returns to an interrogation from a base station; the intention is fundamentally not route navigation and it is not clear how it might be adapted or used for that purpose - let alone how it might be linked with either a primary forward scan guidance system of Margolis.

Bush is concerned with (center) lane detection using buried passive resonant circuitry to induce a reaction in a vehicle detector, giving a visual indication for driver steering action; provision for

automated steering linkage or correction is not implemented; a radical route departure with loss of reference would mean total and irrecoverable loss; thus no back-up is envisaged; no consideration is given to emergency braking, either alone or in conjunction with steering. Further, Bush relies upon driver reaction to indication of corrective steering direction. Automatic servo controlled steering art is acknowledged, but with attendant disconcerting vehicle movement changes - so Bush brings the driver back into the control loop.

Tachibana uses simple embedded individual route markers with intervening radio beacon tags to provide steering correction; again wholesale loss of signal attendant major departure or system failure is not provided for; there is not secondary system, nor involvement of emergency braking.

Mio seeks to address multiple vehicles in an overall management system; there is no secondary system with independent route negotiation nor coordinated emergency steering and braking; the present invention provides individual vehicle control, without reference to other vehicles; gross failures and route departures are not considered; nor is independent secondary route negotiation and coordinated emergency braking.

Fujii seeks vehicle speed control, particularly in a turn, in conjunction with navigation; dual independent negotiation and steering, one with coordinated braking are not contemplated.

Tamura uses embedded magnetic nails for route delineation, but again no independent route negotiation or coordinated braking.

Lemelson is a GPS based wide area navigation system, not a route negotiation approach.

The remaining art is similarly deficient in contemplating dual mode steering and braking, and so does not merit individual discussion.

CONCLUSION

For all of the above reasons, Applicant submits that the new claims define patentably over the prior art, and requests reconsideration and withdrawal of the rejections contained in the November 21, 2005 Office Action. Applicant submits that this application is now in condition for allowance, which action they respectfully solicit.

Respectfully,

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